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Physics of Organic Semiconductors
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Expertise and interest

Our main research interests cover the study of photophysical properties and the correlation between morphology and optical and electrical functionalities. The materials objects of our studies are organic semiconductors, nanostructured materials and hybrids composites that could be used in several optoelectronic applications such as solar energy conversion.
The tools of choice for the photophysical characterization are time resolved photoluminescence spectroscopy and photoinduced absorption. The labs are equipped with a Ti:Saphire pulsed laser that allows to tune the excitation wavelength between 730-900 nm and 370 - 450 nm. The detection systems are two Hamamatsu Streak cameras reaching a time resolution down to 2 ps both in the visible and in the near infrared spectral region (up to 1500 nm). Decay times from few ps up to one ms could be measured.
The optical-morphological characterization is performed by Scanning Near Field Optical Microscopy (SNOM) (lateral resolution down to 80 nm) and Confocal Microscopy (lateral resolution down to 250 nm). Both techniques could provide local photoluminescence spectral information by mean of a fiber coupled spectrometer-Si-CCD system.
The combination of photophysical and morphological studies gives valuable physical information to study the interfaces between photoactive materials and to understand the correlation between morphology and fundamental processes like charge carrier generation and recombination that are crucial for the improvement of the performances of photovoltaic devices.

Keywords: Time resolved photoluminescence, spatially resolved spectroscopy, interfaces, charge transfer excitons.

References

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